

WHAT IS CLAIMED IS:

1. A control circuit for controlling an output voltage of a DC/DC converter, wherein the DC/DC converter
5 includes a main switching element and a synchronous switching element, the control circuit comprising:

a pulse signal generation circuit which generates a pulse signal for controlling the output voltage of the DC/DC converter based on the output voltage; and

10 a drive signal generation circuit connected to the pulse signal generation circuit in which the drive signal generation circuit generates first and second drive signals using the pulse signal for respective supply to the main switching element and the synchronous switching element
15 such that the main switching element and the synchronous switching element are turned ON and OFF alternately at different timings due to receiving the first and second drive signals, and the drive signal generation circuit generates the first drive signal such that the first drive
20 signal has substantially the same pulse width as that of the pulse signal.

2. The control circuit according to claim 1, wherein the drive signal generation circuit generates the second
25 drive signal such that the second drive signal has a larger pulse width than the first drive signal using the pulse signal and the first drive signal.

3. The control circuit according to claim 1, wherein
30 the drive signal generation circuit includes:

a first delay circuit which generates the first drive signal by delaying the pulse signal;

a second delay circuit connected to the first delay

circuit, the second delay circuit generating a delayed signal by delaying the first drive signal; and

a synthesis circuit connected to the second delay circuit, and the synthesis circuit generating the second
5 drive signal by synthesizing the pulse signal with the delayed signal.

4. The control circuit according to claim 3, wherein the first and second delay circuits each include a
10 plurality of inverter circuits.

5. The control circuit according to claim 3, wherein the first and second delay circuits each include an integrating circuit having a resistor and a capacitor.
15

6. The control circuit according to claim 3, wherein the synthesis circuit includes a NOR circuit.

7. A control circuit for controlling an output
20 voltage of a DC/DC converter, wherein the DC/DC converter includes a main switching element and a synchronous switching element, the control circuit comprising:

an error amplification circuit which compares the output voltage of the DC/DC converter and a reference
25 voltage to generate an error signal;

a comparison circuit connected to the error amplification circuit in which the comparison circuit compares the error signal and a triangular wave signal to generate a pulse signal having a pulse width proportional
30 to the voltage of the error signal; and

a drive signal generation circuit connected to the comparison circuit, the drive signal generation circuit generating first and second drive signals using the pulse

signal for respective supply to the main switching element and the synchronous switching element such that the main switching element and the synchronous switching element are turned ON and OFF alternately at different timings due to receiving the first and second drive signals, and the drive signal generation circuit generating the first drive signal such that the first drive signal has substantially the same pulse width as that of the pulse signal.

10 8. The control circuit according to claim 7, wherein the drive signal generation circuit generates the first drive signal by delaying rising and falling of the pulse signal.

15 9. The control circuit according to claim 7, wherein the drive signal generation circuit generates a delayed signal by delaying rising and falling of the first drive signal and generates the second drive signal by synthesizing the delayed signal with the pulse signal.

20 10. The control circuit according to claim 7, wherein the drive signal generation circuit includes:

 a first delay circuit which generates the first drive signal by delaying the pulse signal;

25 a second delay circuit connected to the first delay circuit, the second delay circuit generating a delayed signal by delaying the first drive signal; and

 a synthesis circuit connected to the second delay circuit, the synthesis circuit generating the second drive signal by synthesizing the pulse signal with the delayed signal.

30 11. The control circuit according to claim 10,

wherein the first and second delay circuits each include a plurality of inverter circuits.

12. The control circuit according to claim 10,
5 wherein the first and second delay circuits each include an integrating circuit having a resistor and a capacitor.

13. The control circuit according to claim 10,
wherein the synthesis circuit includes a NOR circuit.
10

14. A DC/DC converter comprising:
a main switching element;
a synchronous switching element connected in series to
the main switching element;
15 a smoothing circuit connected to a node between the
main switching element and the synchronous switching
element, the smoothing circuit generating an output
voltage; and

a control circuit which controls the output voltage by
20 supplying a first drive signal to the main switching
element and supplying a second drive signal to the
synchronous switching element, the control circuit
including:

a pulse signal generation circuit which
25 generates a pulse signal for controlling the output voltage
based on the output voltage; and

a drive signal generation circuit connected to
the pulse signal generation circuit, the drive signal
generation circuit generating the first and second drive
30 signals by using the pulse signal such that the main
switching element and the synchronous switching element are
turned ON and OFF alternately at different timings, and the
drive signal generation circuit generating the first drive

signal such that the first drive signal has substantially the same pulse width as that of the pulse signal.

15. The DC/DC converter according to claim 14,
5 wherein the drive signal generation circuit generates the second drive signal having a larger pulse width than the first drive signal using the pulse signal and the first drive signal.

10 16. The DC/DC converter according to claim 14,
wherein the drive signal generation circuit includes:
a first delay circuit which generates the first drive signal by delaying the pulse signal;
a second delay circuit connected to the first delay
15 circuit, the second delay circuit generating a delayed signal by delaying the first drive signal; and
a synthesis circuit connected to the second delay circuit, and the synthesis circuit generating the second drive signal by synthesizing the pulse signal and the
20 delayed signal.

17. The DC/DC converter according to claim 16,
wherein the first and second delay circuits each include a plurality of inverter circuits.

25 18. The DC/DC converter according to claim 16,
wherein the first and second delay circuits each include an integrating circuit which having a resistor and a capacitor.

30 19. The DC/DC converter according to claim 16,
wherein the synthesis circuit includes a NOR circuit.

20. The DC/DC converter according to claim 16,

wherein the pulse signal generation circuit includes:

an error amplification circuit which compares the output voltage and a reference voltage to generate an error signal; and

5 a comparison circuit connected to the error amplification circuit, and the comparison circuit comparing the error signal and a triangular wave signal to generate a pulse signal having a pulse width proportional to the voltage of the error signal.

10

21. A method for controlling an output voltage of a DC/DC converter, wherein the DC/DC converter includes a main switching element and a synchronous switching element, the method comprising:

15 generating a pulse signal for controlling the output voltage of the DC/DC converter based on the output voltage;

generating a first drive signal which has substantially the same pulse width as that of the pulse signal and supplying the first drive signal to the main
20 switching element; and

generating a second drive signal using the pulse signal and the first drive signal and supplying the second drive signal to the synchronous switching element such that the main switching element and the synchronous switching
25 element are turned ON and OFF alternately at different timings.